Health Canada Santé Canada

Canadian Guidelines for Body Weight Classification in Adults
- Quick Reference Tool for Professionals -

Highlights

- The Canadian Guidelines for Body Weight Classification in Adults uses the body mass index and waist circumference as indicators of health risk.
- This classification system is aligned with the World Health Organization's (WHO) recommendations widely adopted internationally.
- This classification system is derived from population data. When used with individuals, weight classification is only one component of a more comprehensive health assessment needed to clarify health risk.
- The classification system is not intended for use with:
  - those under 18 years of age, and
  - pregnant and lactating women.

Special consideration is also needed when using the classification system. It may underestimate or overestimate health risks in specific groups such as: young adults who have not reached full growth, adults who naturally have a very lean body build, highly muscular adults, adults over 65 years of age, and certain ethnic and racial groups. More information is provided in the full report available online (www.healthcanada.ca/nutrition).

Body Mass Index (BMI)

- The BMI (weight (kg)/height $(m)^2$) is not a direct measure of body fat but it is the most widely investigated and most useful indicator, to date, of health risk associated with under and overweight.

Classification	BMI Category (kg/m^2)	Risk of developing health problems
Underweight	< 18.5	Increased
Normal Weight	18.5 – 24.9	Least
Overweight	25.0 – 29.9	Increased
Obese		
Class I	30.0 – 34.9	High
Class II	35.0 – 39.9	Very high
Class III	≥ 40.0	Extremely high

Note: For persons 65 years and older the 'normal' range may begin slightly above BMI 18.5 and extend into the 'overweight' range.

Adapted from: WHO (2000) Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation on Obesity.

Some health problems associated with body weight

Overweight and obesity	Underweight*
Type 2 diabetes	Undernutrition
Dyslipidemia	Osteoporosis
Hypertension	Infertility
Coronary heart disease	Impaired immunocompetence
Gallbladder disease	
Obstructive sleep apnea	
Certain cancers	

*May indicate an eating disorder or other underlying illness.

Waist Circumference (WC)

- WC is an indicator of health risk associated with excess abdominal fat.

To determine WC, the measurer should stand beside the individual. WC is measured at the part of the torso located midway between the lowest rib and the iliac crest (top of pelvic bone). The tape should fit without compressing any underlying soft tissues.

WC Cut-off Points	Risk of developing health problems*
Men ≥ 102 cm (40 in.)	Increased
Women ≥ 88 cm (35 in.)	

*Risk for type 2 diabetes, coronary heart disease, hypertension.

Adapted from: WHO (2000) Obesity: Preventing and Managing the Global Epidemic. Report of a WHO Consultation on Obesity.

Health risk classification using both BMI and WC

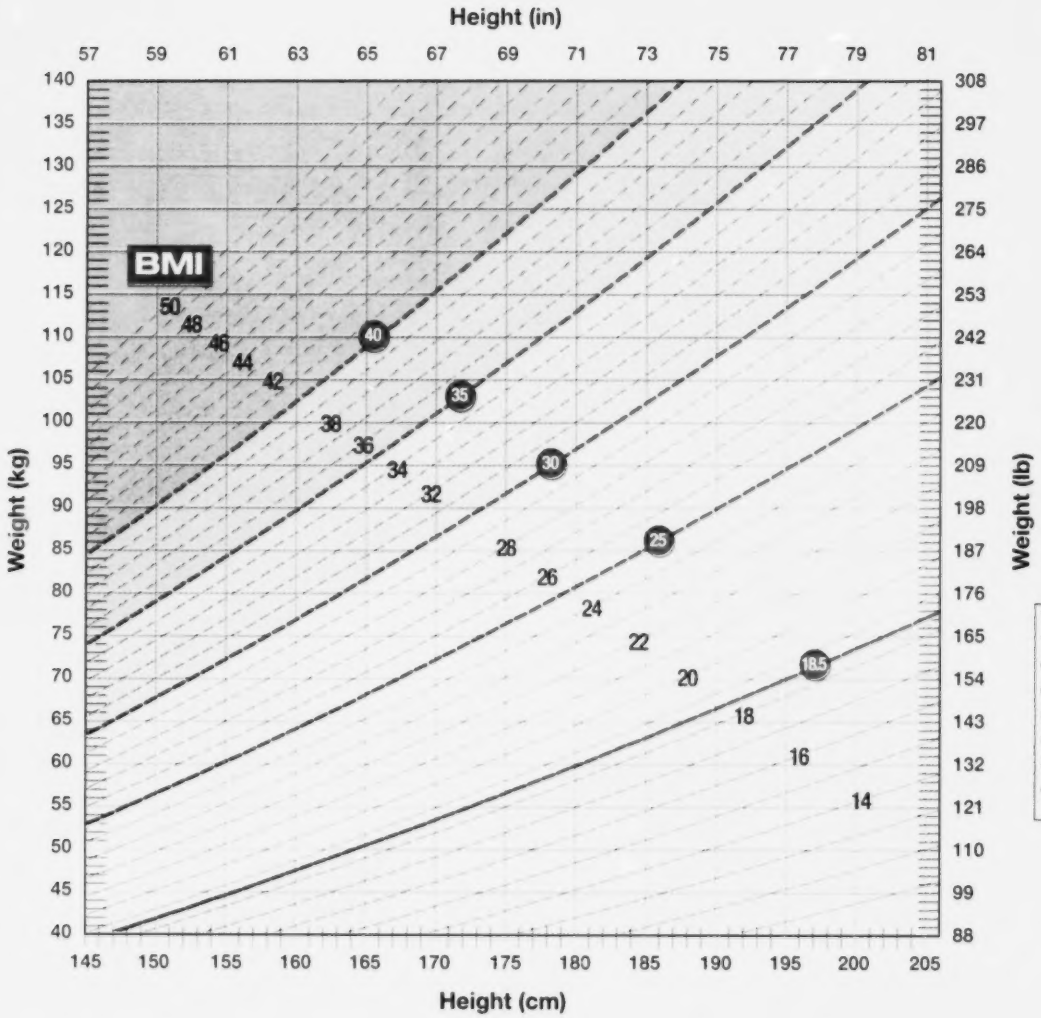
- WC measurement can be used for individuals with a BMI in the 18.5-34.9 range. For BMIs ≥ 35.0, WC measurement does not provide additional information regarding level of risk.

		BMI		
		NORMAL	OVERWEIGHT	OBESE Class 1
WC	< 102 cm (Males) < 88 cm (Females)	Least Risk	Increased Risk	High Risk
	≥ 102 cm (Males) ≥ 88 cm (Females)	Increased Risk	High Risk	Very High Risk

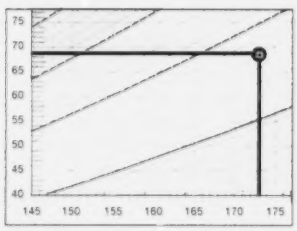
Adapted from: National Institutes of Health (1998) Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report.

Canada

- Body Mass Index (BMI) Nomogram -



For a quick determination of BMI (kg/m^2), use a straight-edge to help locate the point on the chart where height (in or cm) and weight (lb or kg) intersect. **Read the number on the dashed line closest to this point.** For example, an individual who weighs 69 kg and is 173 cm tall has a BMI of approximately 23.



Refer to the table below to identify the level of health risk associated with a particular BMI.

BMI Formula

BMI can also be calculated using this formula
$\text{BMI} = \frac{\text{weight in kilograms}}{(\text{height in metres})^2}$

Note: 1 inch = 2.54 centimetres and 1 pound = 0.45 kilograms

BMI	Risk of developing health problems
< 18.5	Increased
18.5 – 24.9	Least
25.0 – 29.9	Increased
30.0 – 34.9	High
35.0 – 39.9	Very high
≥ 40.0	Extremely high

Note: For persons 65 years and older the 'normal' range may begin slightly above BMI 18.5 and extend into the 'overweight' range.

Adapted from: WHO (2000) Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity

To clarify risk for each individual, other factors such as lifestyle habits, fitness level, and presence or absence of other health risk conditions also need to be considered.

The full report "Canadian Guidelines for Body Weight Classification in Adults", and other resources are available online at:

www.healthcanada.ca/nutrition

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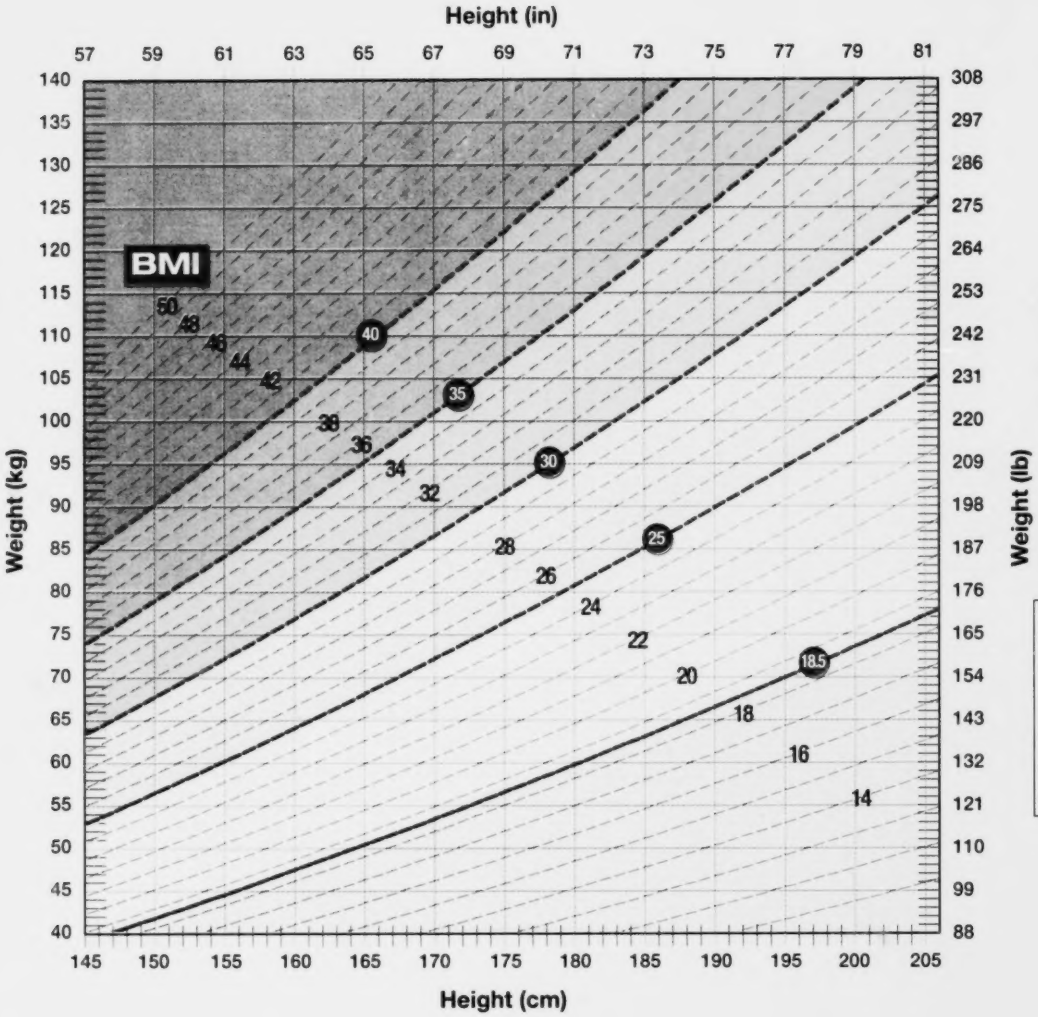
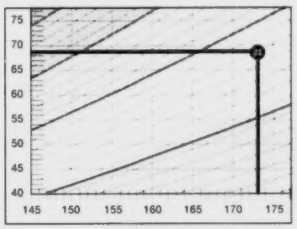
- Body Mass Index (BMI) Nomogram -



For a quick determination of BMI (kg/m²), use a straight-edge to help locate the point on the chart where height (in or cm) and weight (lb or kg) intersect. **Read the number on the dashed line closest to this point.** For example, an individual who weighs 69 kg and is 173 cm tall has a BMI of approximately 23.



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Canadian Guidelines for Body Weight Classification in Adults

Canada

Canadian Guidelines for Body Weight Classification in Adults

Our mission is to help the people of Canada maintain and improve their health.

Health Canada

Canadian Guidelines for Body Weight Classification in Adults

Health Canada encourages the widespread acceptance and use of this updated body weight classification system.

Please address comments to:
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Executive Summary

This technical report describes a body weight classification system for Canadian adults, including the development, uses, interpretation and limitations of the system. The report was developed by Health Canada staff and an Expert Working Group of Canadian researchers and practitioners, and reviewed by leading Canadian organizations. It is intended for health professionals, researchers and educators involved in research and practice related to body weight.

The weight classification system can be used to identify weight-related health risks in populations and in individuals. It is intended for use among Canadian adults age 18 years and older. At the individual level, the system should be used as one part of a more comprehensive assessment of health risk.

The weight classification system provides a scheme for categorizing health risk according to body weight, as measured by body mass index (BMI), and level of abdominal fat, as measured by waist circumference (WC). BMI (kg/m^2) is the most useful indicator, to date, of weight-related health risk, and WC is a practical indicator of risk associated with excess abdominal fat.

There is a continuous relationship between gradations of BMI and health risk, and between WC and health risk. However, cut-off points for each of these measures have been established for the purpose of identifying different levels of health risk. These cut-off points are not intended as targets for intervention purposes in individuals.

The following categories of BMI are used to identify levels of health risk (relative to 'normal weight' category) as follows:

<18.5	*Underweight*	Increased risk
18.5 - 24.9	*Normal weight*	Least risk
25.0 - 29.9	*Overweight*	Increased risk
30 and over	*Obese*	
30.0 - 34.9	*Obese Class I*	High risk
35.0 - 39.9	*Obese Class II*	Very high risk
≥40.0	*Obese Class III*	Extremely high risk

Health risks associated with the underweight category include undernutrition, osteoporosis, infertility, and impaired immunocompetence. Underweight may also be an indication of an eating disorder or other underlying illness. Health risks associated with overweight and obesity include type 2 diabetes, dyslipidemia, hypertension, coronary heart disease, gallbladder disease, obstructive sleep apnea, and certain cancers.

Waist circumference is also an important indicator of health risk. Sex-specific cut-off points for WC have been established to identify health risk associated with excess abdominal fat.

For men:	WC ≥ 102 cm (40 in.)
For women:	WC ≥ 88 cm (35 in.)

A WC above these cut-off points is associated with increased risk (relative to a WC below these values) of type 2 diabetes, coronary heart disease, and hypertension. The WC measurement should be used among those with BMIs between 18.5 and 34.9, to identify additional risk. For BMIs ≥ 35.0, the WC measurement does not provide additional information on health risk.

The system is recommended for use among Canadian adults, except pregnant and lactating women. There are some limitations to the use of this weight classification system among certain groups. Special considerations are required when applying this system to:

- young adults who have not reached full growth
- adults who are naturally very lean
- adults with a very muscular body build
- older adults (over 65 years of age)
- certain ethnic or racial groups

The weight classification system described in this report is an update of the 1988 *Canadian Guidelines for Healthy Weights*. It is in accord with the weight classification system released by the World Health Organization, which has been widely adopted internationally.

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1. Introduction

Highlights

- Body weight and concerns about body weight result in considerable physical, psychosocial, and economic costs in the Canadian population.
- Overweight and obesity have increased among Canadians over the past two decades and are linked to many common chronic diseases.
- Underweight, although much less prevalent, has significant health consequences.
- A body weight classification system can be used to identify weight-related health risks in populations and in individuals.
- The updated Canadian body weight classification system uses two measures to indicate health risks: the body mass index (BMI) and the waist circumference (WC).
- Both the 1988 "Canadian Guidelines for Healthy Weights" and the weight classification system of the World Health Organization form the basis of the 2003 "Canadian Guidelines for Body Weight Classification in Adults".

This technical report includes a description of a body weight classification system for adults age 18 years and older, including its uses and limitations. The report also includes a description of the technical information underlying the development of the system and recommendations for the future.

The concept of weight classification has a broader meaning than solely body weight. The body mass index (BMI) includes both height and weight and is significantly correlated with total body fat. It is an indicator of health risk associated with underweight, overweight and obesity. The waist circumference (WC) is positively correlated with abdominal fat and is an independent indicator of health risk associated with abdominal obesity.

This report is intended for researchers, health professionals and educators involved in the promotion of healthy weights and the treatment of weight-related health problems. A 'quick reference' resource for professionals on the body weight classification system has been developed to accompany this technical report (available online at: www.healthcanada.ca/nutrition). This report and the weight classification system described provide but one component of a comprehensive initiative needed to promote healthy weights in the Canadian population.

Although the weight classification system described in this report is for the adult population, a weight classification system for children and youth is also needed.

1.1 Weight-related health risks

The prevalence of overweight and obesity in Canadian adults has increased over the past two decades [1-3]. Overweight is associated with an increased risk for health problems such as type 2 diabetes, dyslipidemia, hypertension, coronary heart disease, gallbladder disease, obstructive sleep apnea, and certain cancers [4]. Table 1 provides a more comprehensive list of health problems that are associated with overweight and obesity.

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1.1 Weight-related health risks

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Table 1 - Health problems associated with overweight and obesity
Type 2 diabetes
Dyslipidemia
Insulin resistance
Gallbladder disease
Obstructive sleep apnea and respiratory problems
Cardiovascular disease (e.g. coronary heart disease and ischemic stroke)
Hypertension
Osteoarthritis
Some types of cancer (breast, endometrial, colon, prostate and kidney)
Psychosocial problems
Functional limitations
Impaired fertility

The prevalence of underweight in Canada is small in comparison to the prevalence of overweight and obesity, however, the risks associated with underweight are significant [5-7]. This is evident in seniors where underweight is associated with conditions such as osteoporosis and respiratory disease and where underweight and/or weight loss may be early signs of underlying disease [8,9]. It is also evident in the small proportion of the population with eating disorders [10]. Table 2 provides a list of health problems associated with underweight.

Table 2 – Health problems associated with underweight*
Undernutrition
Osteoporosis
Infertility
Impaired immunocompetence

** Underweight may be an indication of an eating disorder or other underlying illness.*

Finally, unhealthy practices such as smoking and restricted food habits used to manage body weight continue to be problems among segments of the population [11]. In addition, unhealthy attitudes toward weight, including dissatisfaction with weight and preoccupation with losing weight, even in the normal weight range, are common among young women [12]. There are also considerable economic costs associated with body weight problems in Canada [13].

1.2 Developing a body weight classification system

In general, a body weight classification system is based on information gathered from descriptive studies of large populations in which a range of body weights is correlated with health risk. Although health risks occur along a continuum of body weights, cut-off points along this continuum are made that define specific ranges of risk.

A weight classification system is based on populations that consist of diverse groups of individuals from different life-stages and different ethnic or racial backgrounds. In addition, a variety of weight-related health problems are analyzed in the development of a risk-based weight classification system. Health risks along the continuum may vary depending on these factors, which must be balanced in the development of a population-wide weight classification system. With regard to individuals, risk and protective factors that result, for example, from eating habits, physical activity patterns, tobacco use, and genetic influences may affect the risk of developing health problems, independent of weight status. Despite these limitations, a population-based weight classification system provides a useful tool for establishing health risks associated with body weight in the population and for conducting initial assessments to identify health risks in individuals.

The updated weight classification system for adults described in this report has evolved from previous work by Canadian researchers undertaken during the 1980's which culminated in the 1988 document, *Canadian Guidelines for Healthy Weights*. The 1988 document described the first body weight classification system accepted nationally for use by professionals, policy-makers, and the general public [5].

Further international studies led to the development of a global weight classification system by the World Health Organization (WHO) in 1995 [14], and the refinement of this system in 2000 [4]. The WHO has recommended that this system be adopted internationally [4]. Based, in part, on these recent developments by the WHO, a process was undertaken by Health Canada to review and update the 1988 *Canadian Guidelines for Healthy Weights*.

The updating process was undertaken through the combined efforts of Health Canada staff and an Expert Working Group that represented a wide range of disciplines related to body weight and health. A summary of the process followed to complete the update is provided in Appendix 7.1. Members of the Expert Working Group as well as the Health Canada project team are listed in Appendices 7.2 and 7.3. Appendix 7.4 lists background materials that were developed to support the update of the body weight classification system and Appendix 7.5 lists the key stakeholders that were consulted during an external consultation on the draft report.

2. Description of the Canadian Guidelines for Body Weight Classification in Adults

Highlights

- The Canadian body weight classification system uses the body mass index (BMI) to identify weight-related health risks.
- The waist circumference (WC) is included in the system as an indicator of abdominal obesity and associated health problems.
- The system has been developed for adults age 18 years and older but it is not appropriate for pregnant and lactating women.
- At the population level, the system can be used to compare body weight patterns and related health risks within and between populations and to establish population trends in body weight patterns.
- Information derived from the application of the weight classification system can help to guide health policy decisions as well as provide a tool for the evaluation of public health intervention programs.
- At the individual level, the BMI and WC are only two components of a comprehensive health assessment.
- The cut-off points in a weight classification system are not intended as targets for weight management intervention in individuals.

The *Canadian Guidelines for Body Weight Classification in Adults* provides a scheme for classifying body weight, as measured by the body mass index (BMI), according to the level of health risk. The BMI is an index of weight to height (kg m^{-2}) and is considered to be the most useful indicator of health risks associated with both overweight and underweight [4,14]. Table 3 shows the level of health risk associated with the range of BMIs in each of the BMI categories. The BMI, however, does not provide an indication of the *distribution* of fat in the body and research has shown that excess fat in the abdominal area is associated with an increased risk to health.

The measurement of waist circumference (WC) provides a simple and practical method for estimating abdominal fat and is an independent indicator of health problems associated with abdominal obesity [4,15]. Table 4 shows the health risk associated with an elevated WC. Table 5 illustrates levels of risk associated with the BMI and WC combined.

The level of health risk refers to *relative* risk, that is, the risk of developing health problems in those with abnormal levels or distribution of body fat, as measured by BMI or WC, compared to those in a normal range. It is important to note that the risk for an individual will be influenced by a unique combination of factors which must be considered in addition to BMI and or WC [16]. It is also important to note that BMI does not reflect weight history. Recent weight gains or weight losses may be associated with health risks independent of BMI categorization and require assessment in individuals [14].

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2.1 Tables

Tables 3, 4, and 5 provide a synopsis of the body weight classification system. The information that follows these tables provides details on the proper use, interpretation, and limitations of the weight classification system.

Table 3: Health Risk Classification According to Body Mass Index (BMI)
For use with adults age 18 and older. Not for use with pregnant and lactating women.

Classification	BMI Category (kg/m²)	Risk of developing health problems
Underweight	<18.5	Increased
Normal Weight	18.5 - 24.9	Least
Overweight	25.0 - 29.9	Increased
Obese		
Class I	30.0 - 34.9	High
Class II	35.0 - 39.9	Very high
Class III	≥40.0	Extremely high

Note: For persons 65 years and older the 'normal' range may begin slightly above BMI 18.5 and extend into the 'overweight' range.

Adapted from: World Health Organization. (2000). *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva: WHO, page 9

Table 4: Health Risk Classification According to Waist Circumference (WC)
For use among adults age 18 and older. Not for use with pregnant and lactating women.

For BMIs in the 18.5 – 34.9 range, use WC as an additional indicator of health risk. For BMIs ≥35, WC measurement does not provide additional information regarding level of risk.

WC Cut-Off Points	Health Risk (relative to WC below cut-off point)
Men ≥102 cm (40 in.) Women ≥ 88 cm (35 in.)	Increased risk of developing health problems*

* Risk for type 2 diabetes, coronary heart disease, hypertension

Adapted from: World Health Organization. (2000). *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva: WHO, page 9

Table 5: Health risk* classification according to Body Mass Index (BMI) and Waist Circumference (WC)

WAIST CIRCUMFERENCE (WC)	BODY MASS INDEX (BMI)		
	NORMAL	OVERWEIGHT	OBESE CLASS I
<102 cm (Males) <88 cm (Females)	Least risk	Increased risk	High risk
≥102 cm (Males) ≥88 cm (Females)	Increased risk	High risk	Very high risk

*Risk is relative to normal BMI and a waist circumference of < 102 cm for males and < 88 cm for females

Adapted from: National Institutes of Health, National Heart, Lung, and Blood Institute. (1998). Clinical Guidelines on the Identification, Evaluation, and Treatment of Overweight and Obesity in Adults: The Evidence Report. Washington, DC: NIH, page17

2.2 General use and limitations of the body weight classification system

The weight classification system is appropriate for adults age 18 years and older. Although an adult is defined physiologically as one who has reached his/her full growth potential, for practical purposes age 18 has been used as the lower age limit, as full growth will be reached by the majority of individuals by this age. An upper age limit has not been established. However, limitations regarding weight classification for seniors, age 65 and older, are described in Section 3.5. In addition, there are limitations to weight classification that arise from the wide variation in body builds and body proportions in individuals and in populations. These are also discussed more fully in Section 3.5. Finally, the weight classification system is not appropriate for use with pregnant and lactating women.

The weight classification system can be applied to both populations and individuals in order to: [4]

1. Conduct meaningful comparisons of body weight patterns within and between populations;
2. Identify populations and individuals at increased risk of morbidity and mortality;
3. Identify priorities for intervention at the population and individual levels;
4. Evaluate interventions at the population and individual levels.

A distinction must be drawn between applications of the weight classification system at the population and individual levels.

2.3 Use with populations

At the population level, BMI categories that range from 'underweight' to 'obese' can be applied to identify body weight patterns *within* the population. Prevalence estimates of different

body weight levels in populations can be derived and the relative risk of morbidity and mortality determined for each BMI category. In addition, a weight classification system can identify trends in body weight patterns in the population as part of a longitudinal surveillance system.

The weight classification system can also be applied to draw comparisons of body weight patterns and health risks ***between*** populations. However, such comparisons should be interpreted with caution because the BMI or WC may not correspond to the same level of risk in different populations. For example, the influence of other factors, such as ethnicity or race, may result in differences between populations in the prevalence of disease associated with each BMI category. On the other hand, the pattern of ***relative*** risk of weight-related diseases, that is the risk between those of abnormal weight as compared to those of normal weight, is fairly consistent across populations [4].

The information derived from body weight surveillance and associated health risks can help guide health policy decisions. It can also serve as a component in the evaluation of population-based intervention programs.

2.4 Use with individuals

At the individual level, weight classification can be used as an initial assessment tool to identify individuals at increased relative risk for morbidity and mortality. Due to the effects of other factors, there is considerable variability among individuals in the risk associated with a specific BMI or WC category [16]. For this reason, the estimation of an individual's health risk should not be based on measures of body weight and waist measurement alone.

Measures of BMI and WC should be components of a more comprehensive health assessment of the individual. This assessment could also include, depending on age and other factors, information on the presence of other risk factors, such as hypertension, dyslipidemia, family history of disease and individual weight history (i.e., patterns of weight gain and/or weight loss). In addition, individual health behaviours such as tobacco use, eating habits, and physical activity patterns also require assessment as do weight-related psychological and social factors.

Finally, the cut-off points included in the weight classification system are not meant to represent weight management intervention targets [14]. These depend on individual characteristics.

3. Use, interpretation and limitations

Highlights

- The BMI is the most useful indicator, to date, of health risks associated with overweight and underweight.
- In the body weight classification system, categories of BMI ranging from underweight to obese, are used to identify levels of health risk.
- The WC is an independent and practical indicator of abdominal obesity and related health risks.
- As with BMI, the relationship between WC and health risk is continuous. However, the body weight classification system uses one WC cut-off point for men and another for women to identify level of risk.
- Groups for whom the body weight classification system may have some limitations include:
  - young adults who have not attained full growth;
  - adults who have a naturally very lean body build;
  - adults who have a very muscular body build;
  - adults over 65 years of age;
  - certain ethnic or racial groups.
- Despite some limitations, the body weight classification system that has been developed for the Canadian population in general can be used for all Canadian adults, with the exception of pregnant and lactating women. When used with individuals, a more comprehensive assessment is required to clarify health risk.

As mentioned previously, there is a *continuous* relationship between gradations of BMI and risks of morbidity and mortality. This relationship can be depicted as a U or J-shaped curve. The health risk is lowest for BMIs corresponding to the bottom or flat part of the curve (the normal weight range), and increases as the curve rises at either end [14]. For practical purposes, BMIs are classified into four categories with cut-off points established to define a range of BMIs for each category as shown in Table 3.

The relationship between WC and health risk is also continuous, however, there is less information, to date, to establish WC cut-off points related to different levels of health risk along the WC continuum. Because of this limitation only one WC cut-off point for men and one for women have been included in Table 4.

3.1 Body mass index

The BMI is an index of weight-to-height (kg/m^2). Although it is high levels of body fat that are most closely linked to health risks for overweight people and low levels of fat and lean tissue that pose a risk for underweight people, methods to directly measure these tissues are not practical for widespread use. The BMI is not a direct measure of body fat or lean tissue, but it is, to date, the most widely investigated and most useful indicator of health problems that are associated with under and overweight [14].

The relationship between BMI and health risk is independent of height as differences in height are accounted for in the BMI formula [5]. However, the BMI as an indicator of risk may have limitations for individuals or populations who are very tall or very short or who have very long or short limb lengths in relation to trunk measurement [14].

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The relationship between BMI and health risk is also independent of sex. Although women, on average, have higher levels of body fat than men at the same BMI [14], their risk of health problems does not differ appreciably within the same BMI category [5].

Measuring BMI

To calculate the BMI, weight and height must be measured. Weight should be measured with individuals wearing light clothing and no shoes, and recorded to the nearest 0.2 kg (1/2 lb). Height should be measured with no shoes, standing erect, looking straight ahead, feet together and heels against a wall or measuring board. A horizontal bar, rectangular block of wood or another similar device should be lowered to rest flat on the top of the head. Height should be recorded to the nearest 0.5 cm (1/4 in) [17].

A body mass index chart has been provided in Appendix 7.6 for a quick determination of BMI at varying weights and heights.

3.2 Body mass index categories

(Refer to Table 3)

BMI less than 18.5 – Underweight

A BMI in the underweight range is an indication of increased health risk. Underweight is associated with health problems such as undernutrition, osteoporosis, respiratory disease and eating disorders [18-21]. Underweight may also be due to the effects of unrecognized underlying disease [19].

For seniors (age 65 and over), the risks associated with underweight may be evident at a BMI somewhat higher than that for younger adults [9,22]. A BMI in the low 20's suggests a need for a further health assessment.

For young adults who have not reached full growth [14], or for adults who naturally have a very lean body build [23], a BMI somewhat less than 18.5 is not necessarily an indication of health problems.

BMI 18.5 to 24.9 – Normal weight

A BMI in the normal range has been shown in population-wide studies to be associated with the lowest relative risk of morbidity and mortality. It should be noted that the entire range of BMIs in the "normal weight" category are indicative of low risk and the lower end of the range should not be viewed as the target weight.

BMI 25.0 to 29.9 – Overweight

Evidence from population-wide studies show that the relative risk of mortality begins to increase at a BMI of 25.0 [14] Risk increases gradually as BMIs increase from 25 to 29.9. However, the BMI does not distinguish between fat and lean mass, therefore individuals with a very muscular body build may have BMIs in this range but without a body fat level associated with health risk. For seniors (age 65 and over), there is evidence to suggest that their relative risk of mortality begins to increase only in the upper levels of the overweight range [8,9,22,24].

BMI 30 and over - Obese

The relative risk of mortality begins to rise more sharply at a BMI of 30. Therefore, BMIs of 30 and over have been categorized as the obese range [4]. The obese range has been further divided into Obesity Class I (30.0 – 34.9), Obesity Class II (35.0 – 39.9) and Obesity Class III (40.0 and over). In general, the higher the BMI the greater the risk to health.

3.3 Waist circumference

Excess abdominal fat is associated with health problems such as type 2 diabetes, coronary heart disease, and hypertension [4,15,25-27]. The WC is positively correlated with abdominal fat and is a practical indicator of health risk associated with abdominal obesity [4,15,28-31]. WC is often used in combination with BMI. However, in some situations WC is also used as an independent indicator of health risk.

For a given WC, men and women have similar levels of abdominal fat [32,33] but women are at higher risk than men at the same WC [4]. The cut-off point for women is therefore set lower than that for men.

Measuring waist circumference

The WC is measured at the part of the trunk located midway between the lower costal margin (bottom of lower rib) and the iliac crest (top of pelvic bone) while the person is standing, with feet about 25-30 cm apart (10-12 in). The measurer should stand beside the individual and fit the tape snugly, without compressing any underlying soft tissues. The circumference should be measured to the nearest 0.5 cm (1/4 in), at the end of a normal expiration [14,33]. Appendix 7.7 provides an illustration of WC measurement.

The measurement of WC is recommended for those with a BMI in the 18.5 - 34.9 range [16,29]. WC is not considered useful in predicting increased risk among individuals with a BMI ≥ 35 because, typically, such individuals will exceed the WC cut-off points and measurement will not provide additional information regarding the level of risk [16].

3.4 Waist circumference cut-off points (Refer to Table 4)

WC's ≥102 cm (40 inches) in men and ≥ 88 cm (35 inches) in women have been shown to be associated with substantially increased risk of diseases associated with abdominal obesity and these cut-off points have been included in this body weight classification system [4,29,34].

Health risk increases along the WC continuum and may begin below the selected cut-off points. However, there is not yet the body of research needed to clearly establish a gradation of health risks and corresponding cut-off points.
The cut-off points in the current system may provide a conservative estimate of health risk, and therefore, are less likely to label people who are not at risk inaccurately but may miss some who are at risk.

Future research on WC cut-off points may result in a graded system which would require modifications to the cut-off points in this current body weight classification system.

3.5 Special considerations when using the *Canadian Guidelines for Body Weight Classification in Adults*

There are limitations regarding the use of the body weight classification system that should be considered. First of all, a weight classification system provides a framework to measure body weight at one point in time. Individuals who experience weight change, either weight gain or weight loss, within or between BMI categories may also be at risk [5,14].

Secondly, young adults who have not reached full growth, adults who naturally have a very lean body build or highly muscular adults may not be at the level of health risk indicated by their BMI categorization. Finally, other groups require special consideration with regard to weight classification. These include seniors, certain ethnic and racial groups, as well as those who are physically fit. More information on these groups is provided below.

Despite these limitations, the weight classification system established for Canadians in general is appropriate for the groups described above. For individuals, however, further assessment procedures are needed to clarify health risks.

a) Special considerations for seniors (adults over age 65)

As noted on Table 3, research suggests that for adults age 65 and older the 'normal' range may begin somewhat above BMI 18.5 and extend into the 'overweight' range (BMI 25.0 to 29.9).

With regard to *underweight*, the point at which the health risks begin to increase for adults over age 65 has been shown in some studies to be at BMIs ranging from around 18.5 to the low 20s [9,22]. It has been suggested that these risks may be linked to unrecognized underlying disease [22]. Nevertheless, BMIs in the low 20s and below in seniors suggest the need for additional health assessment.

Some research has also shown that the relative risk of mortality and morbidity in seniors with BMIs within the *overweight* range (BMI 25.0 to 29.9) is less than that for young and middle-aged adults [9,21,35]. However, the specific point where risk does increase in this category is unclear. In general, BMIs in the upper range of the overweight category are suggestive of increased relative health risk.

With regard to the *obese* range (BMI ≥30.0), an increased relative risk of mortality has been shown among *obese* seniors [9]. In addition, functional limitations such as difficulty in walking short distances, carrying a light load, or standing up from an armless chair have also been demonstrated in obese seniors as compared to seniors within the normal range [36-38].

With regard to WC there is some evidence to suggest that WC cut-off points for seniors should differ from those for younger adults [28,33] and there is conflicting information on the value of using WC, as compared to BMI, to predict risk in this age group [26,39].

Although there is some research to suggest that health risks as indicated by BMI and WC may differ in seniors, for *population* purposes the current classification system is useful and recommended for this group. However, when used in the assessment of *individual* seniors, BMIs should be used with some flexibility as noted in Table 3. At this point in time, the WC cut-off points given in Table 4 can be used as an indication of health risk for seniors. As with other individuals, further assessment procedures will be needed to clarify health risks in individual seniors.

b) Special considerations regarding race and ethnicity

Population studies used to develop the body weight classification system were derived from

predominantly Caucasian populations in the USA and Europe. There is evidence that certain ethnic or racial groups may differ from Caucasians in their levels of total body fat at a given BMI, in their fat distribution patterns, and in their degree of health risk [4,40-44]. Differences may be influenced in part, by differences in body build or body proportions [4,14].

For some groups, such as Black populations, health risks at the same BMI may be less than among Caucasians [14,45]. For others, such as Chinese people [46-49] and people from South Asia (India, Pakistan, Bangladesh and Sri Lanka) [41,50], the risks appear to be greater. It should be noted that urban and migrant South Asians, including South Asian Canadians, have shown a particular susceptibility to obesity, especially abdominal obesity, and related health problems [51-53].

Among First Nations people in Canada, obesity has become a major public health problem in recent years, which has occurred in tandem with the increase in prevalence of type 2 diabetes [54]. Although there are some survey data on the extent of the problem, detailed metabolic investigations as well as follow-up studies to characterize the type of obesity and long-term risks associated with different levels of BMI and/or WC have not been done [55-57]. Recent surveys also provide evidence that obesity is prevalent among Inuit people in Canada [58] but the association between obesity and health risk is not well defined for this group [59]. More research is required to confirm the prevalence of obesity and its metabolic effects among Inuit people as well as among other Canadian Aboriginal populations.

Research in the area of race/ethnicity and body weight, body fat distribution and related health risks is in its early stages, particularly in Canada. At present, the body weight classification system established for Canadians in general is appropriate for all racial/ethnic groups within Canadian society. It is important to note, however, that some groups may be more susceptible to health problems associated with obesity than others.

c) Special considerations regarding physical fitness and diet

Research has shown that regular physical activity can decrease the risk of several health problems and improve health and longevity [60,61]. In one long-term observational study in males, cardiorespiratory fitness, as measured by treadmill testing, was associated with reduced mortality in fit subjects compared to unfit subjects across levels of body weight and body fatness that ranged from lean to obese [62]. In addition, a recent Canadian study showed that individuals with moderate to high cardiorespiratory fitness had less abdominal obesity and less total body fat than their unfit counterparts at the same BMIs [63]. It has been suggested that cardiorespiratory fitness can modify the negative effects of excess body weight and body fat [64]. Broadly based long-term studies in a variety of population groups are needed to substantiate this finding.

Research has also identified the positive effect of a healthy diet on factors such as glucose tolerance and blood pressure even among individuals with elevated BMIs [4,65].

One study in China demonstrated the positive effects of diet and/or physical activity on the prevention of type 2 diabetes in a susceptible population [66]. In each experimental group (diet only, activity only, diet/activity combined), the incidence of diabetes in both lean and overweight subjects was significantly lower than in the control group. A similar study in the U.S. also showed that lifestyle changes reduced the incidence of type 2 diabetes in persons at high risk [67].

Fitness levels and diet are important components of a comprehensive health risk assessment when applying the body weight classification system to individuals.

4. Rationale and justification for decisions

Highlights

- The updated body weight classification system is aligned with the WHO recommendations widely adapted internationally.
- Changes to the updated body weight classification system in comparison to the 1988 Canadian Guidelines to Healthy Weights include:
  - the selection of 18.5 as the lower limit of the 'normal' range;
  - the boundaries of the overweight range at BMI 25 to 29.9;
  - the division of the obese category (BMI ≥30) into 3 subcategories;
  - the use of WC as an indicator of health problems associated with abdominal obesity;
  - the selection of weight terms to define BMI categories.

This section of the report provides the rationale and justification for changes made in order to update Canada's body weight classification system.

As mentioned previously, the 1988 *Canadian Guidelines for Healthy Weights* [5] and the 2000 WHO weight classification system [4] form the basis for the updated weight classification system described in this report. Table 6 illustrates similarities and differences between these three weight classification systems. More detail on the 1988 *Canadian Guidelines for Healthy Weights* plus an accompanying table is included in Appendix 7.8. Appendix 7.9 provides a brief synopsis of the WHO weight classification system with accompanying tables.

Although there are many similarities in the three systems illustrated in Table 6, the differences between the 1988 *Canadian Guidelines for Healthy Weights* and the 2003 body weight classification system are significant. Changes to certain cut-off points in the BMI categories as well as the introduction of WC measurement have considerable impact on the application of the system at both the population and individual levels. The use of the system with adults over age 65 is also a significant change.

As part of the preparatory work to develop the updated weight classification system, a review of weight classification systems used in other countries, such as the USA, England, Scotland, Australia and New Zealand, was also carried out [16,68-71]. This review showed that these countries have adopted the WHO weight classification system, although in some cases with some variations.

The following section summarizes recent research that underlies decisions made in updating the Canadian body weight classification system.

4.1 Lower BMI cut-off point

In the updated body weight classification system, the lower BMI cut-off point of the 'normal' range is 18.5. This differs from work done in Canada in the 1980's which established the lower BMI cut-off point at 20 based on the available evidence at that time [5]. The WHO, on the other hand, has set this lower cut-off point at 18.5. However, epidemiological evidence to support this lower BMI cut-off point is less than for other BMI cut-off points in the updated body weight classification system [72].

The selection of 18.5 is based partially on studies in non-western countries that investigated episodes of illness and ability to work in relation to low BMI levels. Provisional BMI ranges that

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Table 6: Weight classification systems

Canada (1988)†	WHO (2000)††	Canada (2003)
	Body Mass Index (BMI)	
Zone A: <20 May be associated with health problems for some people	Underweight <18.5	Underweight <18.5
Zone B: 20 - 25 Good weight for most people	Normal range 18.50–24.99	Normal 18.5–24.9
Zone C: Between 25 and 27 May lead to health problems in some people	Preobese 25.00–29.99	Overweight 25.0–29.9
Zone D: >27 Increasing risk of developing health problems	Obese class I 30.00–34.99	Obese Class I 30.0–34.9
	Obese class II 35.00–39.99	Obese Class II 35.0–39.9
	Obese class III ≥ 40.00	Obese Class III ≥ 40.0
Waist to Hip Ratio cut-offs	**Waist Circumference**	
	Increased risk	Increased risk
Male: 1.0 Female: 0.8	M: ≥ 94 cm* F: ≥ 80 cm*	M: ≥ 102cm (40 in) F: ≥ 88cm (35 in)
	Substantially increased risk	
	M: ≥ 102 cm* F: ≥ 88 cm*	
	* The cut-points are an example only. The identification of risk using waist circumference is population-specific and will depend on levels of obesity and other risk factors for CVD and NIDDM. This issue is currently under investigation. (WHO, 2000)	

† **Source:** [5]

†† **Source:** [4]

were developed to define underweight (thinness) include: BMI 17-18.49 (mild thinness); BMI 16-16.99 (moderate thinness), and BMI <16 (severe thinness) [14]. Furthermore, in the development of a global weight classification system, a BMI of 20 as the lower cut-off may exclude a substantial number of healthy adults in countries where daily life is more physically demanding than for adults in Western Europe and North America and where, on average, people tend to weigh less [73].

The WHO [4] also reported that a BMI of 18.5 was chosen as the lower cut-off point of the normal range based on information discussed at an American Institute of Nutrition meeting in 1993 [74]. Selected epidemiological studies published since that time were reviewed during the updating process [7,8,9,19,21,22,75]. These studies found an increased health risk with low BMIs, but different BMI cut-off points were used in these studies, making it difficult to determine a preferred lower cut-off point. Cut-off points investigated ranged from 18.5 to 22. Although the effects of smoking and pre-existing illness were controlled for in these studies, some authors suggested that the increased risks might be attributed to the effects of unrecognized underlying disease rather than to low body weight, per se [9,19,22]. Overall, a clear consensus that 18.5 was the preferred cut-off point was not evident from these studies.

A recent study, however, examined the relationship between BMI and mortality in a representative sample of the Canadian population [6]. Based on data from the 1981 Canada Fitness Survey, researchers found a J-shaped relationship between BMI and mortality, with increased risk at BMIs below 18.5 relative to the 18.5 to 24.9 BMI range. The results were unchanged after adjusting for underlying illness by excluding deaths in the first two years of the study period. Age, sex, smoking status and alcohol consumption were included as covariates. These results support the selection of 18.5 as the lower BMI cut-off point and the use of the BMI categories as described in the updated body weight classification system.

In summary, based on evidence provided by the WHO and from recent Canadian data described above, the lower cut-off point of the 'normal' range has been lowered from 20 to 18.5.

4.2 'Overweight' and 'obese' categories

The 2003 Canadian body weight classification system categorizes BMIs between 25.0 and 29.9 as 'overweight' and associated with increased health risk and a BMI of 30 and over as obese and associated with a high to extremely high risk of developing health problems. This is in accord with the WHO weight classification system.

In the 1988 *Canadian Guidelines for Healthy Weights*, it was stated that a BMI between 25 and 27 could 'lead to health problems in some people' and a BMI >27 was associated with 'increasing risk of developing health problems'. Since the publication of the 1988 *Canadian Guidelines*, more research has been conducted on the relationship between BMI and mortality and morbidity risk. The mortality curves generated from these studies show that, in general, relative risk of mortality begins to increase at a BMI of 25 which is in accord with the 1988 *Canadian Guidelines*. These studies show a more marked increase at a BMI of 30 [4,14]. In light of studies such as these, BMIs in the 25-29.9 range are categorized by WHO as the preobese range and BMI's of 30 and over as obese.

The 'obese' category was further sub-divided by WHO into Obesity Class I (30.0 – 34.9), Obesity Class II (35.0 – 39.9) and Obesity Class III (40.0 and over). This has been adopted in the 2003

Canadian body weight classification system. The subdivisions within the 'obese' category are based on the increasing health risks within this category which require different levels of intervention [4].

4.3 Waist circumference and waist circumference cut-off points

The waist to hip ratio was suggested as a measure of abdominal obesity in the 1988 *Canadian Guidelines for Healthy Weights* [5]. Recent research, however, indicates that the WC is a better and more practical correlate of abdominal obesity and related health risks [4,15,25,28]. Total abdominal fat includes both subcutaneous fat (under the skin) and visceral fat (around internal organs). High levels of visceral fat, in particular, have been shown to be associated with several risk factors that influence the development of diabetes and coronary heart disease [32,33]. Waist circumference is an indicator of both total abdominal fat [4,28] and visceral fat [32,33]. The WC has therefore, been incorporated as an independent measure in the updated body weight classification system. Although research has shown that the WC is an important indicator of obesity-related health problems [4,15,25,28-31,76], there is less research to date to identify accurately the most appropriate cut-off points.

The WHO provides two WC risk categories: a) increased risk for men ≥94 cm and for women ≥80 cm, and b) substantially increased risk for men ≥102 cm and for women ≥88 cm [4]. These cut-off points were based on a study that measured relative risks among a sample of 2183 men and 2698 women aged 20-59 from the Netherlands [77]. They were provided as an example only by WHO [4]. It was recommended that specific WC cut-off points that are appropriate for different populations be developed.

A recent study of about 10,000 Canadian men and women evaluated waist circumference cut-off points as predictors of cardiovascular risk factors [28]. The cut-off points identified (≥90 cm in men and ≥80 cm in women) are comparable, particularly for women, to the figures for increased risk in the WHO system (≥94 cm in men and ≥80 cm in women) and provide tentative support for these cut-off figures. Another recent study used the WC cut-off points >88 for women and >102 for men with a large sample of the U.S. population to test the appropriateness of these cut-off points [29]. In BMI categories that ranged from normal to obese, those with WC above the cut-off points had increased risk of one or more obesity-related disorders, such as type 2 diabetes, hypertension and dyslipemia, as compared to those with WC below the cut-off points. This provides support for the WHO cut-off points for substantially increased risk (≥ 88 for women and ≥ 102 for men). These studies are based on cross-sectional data and additional longitudinal studies are needed to support these findings.

In the updated Canadian body weight classification system, cut-off points for the WHO's 'substantially increased' level of risk were selected to prevent possible inappropriate labelling of people. However, a graded system that would differentiate between levels of risk would be a better representation of the WC/health risk continuum. As research adds to the knowledge base on appropriate WC cut-off points, the cut-off points included in the weight classification system may require modification.

4.4 Upper age limit

The updated weight classification system does not specify an upper age limit whereas the 1988 *Canadian Guidelines for Healthy Weights* specified they were appropriate for adults up to 65 years of age. The WHO system, on the other hand, does not specify an upper age limit.

In studies of groups of seniors that were reviewed for this report, the findings were mixed [9,21,22,24,35,36-38,78,79]. Research among seniors is complicated by the heterogeneity of this population and their intrinsic multiple health risks and shorter life expectancy. It is noteworthy that, although the *relative risk* of health problems among overweight/ obese seniors may be lower than that among younger adults, ***both*** normal weight seniors and overweight/obese seniors experience high morbidity and mortality rates. This has led some researchers to question the value of relative risk as a reference point for this population [16].

Additional research with this population is necessary to better understand the health risks associated with BMI levels in seniors. An upper age limit has not been included in the *Canadian Guidelines for Body Weight Classification in Adults*, but qualifying information has been included in this report regarding the possible limitations of weight classification for this group with regard to both overweight and underweight.

4.5 Terminology

Labelling BMI ranges

The updated system provides labels for BMI ranges with weight terms such as 'underweight', 'overweight', and 'obese'. This was not done in the 1988 Canadian system due to the potential for stigmatization based on weight labels. Weight titles, however, are commonly used by professionals to describe weight patterns and trends in populations and for clinical purposes. They are also commonly used and understood by the general public.

Selection of term 'normal' for the least risk range

The term 'normal' weight as used by WHO to describe the 'least risk' category of BMIs was adopted in the updated system. The term healthy weight was considered, however, it may incorrectly imply an assurance of good health for people in this range.

Use of the term 'overweight'

In the updated system, the term 'overweight' has been selected to describe the BMI range 25.0 to 29.9. WHO, on the other hand, uses the term 'overweight' to classify all people with a BMI $\geq$ 25.0. Those in the 25.0 to 29.9 range are termed 'preobese'. In contrast, the USA has adopted the WHO weight classification system but uses the term 'overweight' to describe the BMI range 25.0 to 29.9 only. According to some experts, it should be implicitly understood that those who are classified as obese would also be overweight [80]. To eliminate the potential for confusion when the term 'overweight' is used in the scientific literature, it has been suggested that it should be stipulated what is included i.e. either an all-inclusive overweight (BMI $\geq$ 25.0) or overweight but not obese (BMI 25.0-29.9) [80].

5. Summary and recommendations

This report describes a body weight classification system for adults, and includes information on the development, interpretation, limitations and uses of this system. It has been developed collaboratively by an Expert Working Group of Canadian researchers and health care providers and by staff at Health Canada. It has also been reviewed by a wide variety of Canadian organizations from the government, academic, voluntary, and private sectors. The updated system is in accord with international standards and with those of other industrialized countries.

Throughout the report, the need for additional research in the area of body weight classification has been identified.

A weight classification system for children and youth is urgently needed. Currently, the International Obesity Task Force is working on the development of such a system and preliminary reports of this work have been published [81-83]. This work would inform future efforts to develop a weight classification system for Canadian children and youth.

Special considerations when using weight classification with adults over age 65 have been identified throughout this report, due to evidence that suggests that this group of adults may differ from middle-aged or young adults in their relative risk of weight-related health problems. Further research with this age group is needed to clearly establish their health risks at different BMI ranges and WC measures.

The report has also discussed possible influences of ethnicity and race on weight-related health risks. Research is needed to clarify the limitations of a population-wide system with people of different ethnic and racial groups. The problem of obesity in Canadian Aboriginal peoples has also been raised in this report. Research is needed to better assess the extent of the problem in different Aboriginal peoples and clarify the association between obesity and long-term health risks at different BMI and WC levels. Canada, as a multicultural society, will need to continually appraise world literature in this area and conduct research with ethnic and racial groups in the Canadian population.

Research is also needed to clarify the effects of factors such as fitness and diet on weight-related health problems.

It is noted in the report that research on appropriate WC cut-off points is limited. Additional studies are needed to confirm the validity of the cut-off points proposed in the weight classification system and to determine whether cut-off points to identify different levels of risk can be developed. In addition, more information is needed as to whether the population-wide WC cut-off points are appropriate for different lifecycle and racial/ethnic groups.

As new research advances knowledge on body weight classification and relationships between weight, body fatness, body thinness and health, this weight classification system will require periodic reviews and updating.

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7. Appendices

Appendix 7.1
Process to develop the report

The updated body weight classification system resulted from the combined efforts of staff at Health Canada and an Expert Working Group that represented a wide range of disciplines involved in research and practice related to body weight and health.

Background materials were prepared to support the process and included an initial assessment on the need to update the 1988 *Canadian Guidelines for Healthy Weights*. In addition, a review was undertaken of the WHO weight classification system as well as systems used in various other jurisdictions including Australia, England, New Zealand, Scotland, and the United States.

The Expert Working Group recommended that additional information be prepared in specific areas. This included information regarding body weight and health risks in the areas of underweight, ethnicity, seniors, and fitness as well as information on the use of waist circumference and appropriate cut-off points.

The Expert Working Group members and the Health Canada project team based decisions on their knowledge of evidence from the literature. Decisions were arrived at through consensus.

Drafts of the technical report were reviewed and revised by the Expert Working Group and by Health Canada staff. The last draft was also reviewed by several key stakeholders and stakeholder organizations.

Appendix 7.2
Members of the Expert Working Group

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Faculty of Medicine
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Dr. Janet Polivy
Department of Psychology
University of Toronto

Dr. Bruce Reeder
Department of Community
Health and Epidemiology
University of Saskatchewan

Dr. Kue Young
Department of Public Health Sciences
University of Toronto

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Members of Health Canada's Project Team

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Health Products and Food Branch

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Director General

Tanya Weston

Ann Ellis

Chantal Martineau

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Stefa Katamay

Louise Aubrey

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Consulting Nutritionists and Report Writers

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Bureau of Biostatistics and Computer Applications Food Directorate

Beth Junkins

We would like to acknowledge the contributions from the Bureau of Biostatistics and Computer Applications, Centre for Chronic Disease Prevention and Control, Division of Aging & Seniors, Division of Childhood and Adolescence, First Nations and Inuit Health Branch, Fitness and Active Living Unit, Mental Health Promotion Unit and Women's Health Bureau.

Appendix 7.4
List of background papers

Dr. Linda McCargar

"Should the 1988 Canadian Guidelines for Healthy Weights be Updated" March 2000. Available online at:
www.healthcanada.ca/nutrition

Barbara Davis and Stefa Katamay

"A Review of Weight Guidelines" October 2001. Available online at:
www.healthcanada.ca/nutrition

Barbara Davis and Laurie Ricciuto

"Background Information on Select Issues Raised at the October 2001 Meeting of the Expert Working Group on Healthy Weight Guidelines" April 2002.

Allium Consulting Group Inc.

"Stakeholder Consultation on *Canadian Guidelines for Weight Classification* – Results and Recommendations" November 2002

Appendix 7.5
Stakeholder organizations consulted

The stakeholder list includes organizations from key sectors interested in, and affected by, weight guidelines and strategies. An external consultation was held in the fall of 2002 to obtain feedback on the clarity, comprehensiveness and usefulness of the draft report.

A total of 94 organizations were sent the draft report; 49 responded.

Note: For some organizations several members contributed to a collated response on behalf of their organization.

Academic/Research Institutes

Acadia University - School of Nutrition and Dietetics

Brescia College- University of Western Ontario - Department of Human Ecology

Canadian Institute for Health Information (CIHI)

Canadian Population Health Initiative (CPHI)

Centre for Indigenous Peoples' Nutrition and the Environment

McGill University - Nutrition and Food Science Centre, Crabtree Laboratory

McMaster University - Faculty of Health Sciences

Mt St Vincent University - Applied Human Nutrition Department

Obesity Canada

Ryerson University - Department of Nutrition

St Francis Xavier University - Department of Human Nutrition

Université de Montréal - Département de nutrition, faculté de médecine

Université de Moncton - École des sciences des aliments, de nutrition et d'études familiales

Université Laval - Département des sciences des aliments et de nutrition

University of Alberta - Agricultural, Food and Nutritional Sciences

University of British Columbia - Faculty of Agricultural Sciences

University of Guelph - Department of Family Relations and Applied Nutrition

University of Manitoba - Faculty of Agricultural & Food Sciences

University of Prince Edward Island - Department of Family & Nutritional Sciences

University of Saskatchewan - College of Pharmacy and Nutrition

University of Toronto - Department of Nutritional Sciences

Public Health

Alberta

British Columbia

Institut national de santé publique du Québec

Manitoba

New Brunswick

Newfoundland

Northwest Territories

Nova Scotia

Nunavut

Ontario

Prince Edward Island

Québec

Saskatchewan

Yukon

National health professional organizations

Canadian College of Medical Geneticists

Canadian Nurses Association (CNA)

College of Family Physicians of Canada

Dietitians of Canada

L'Ordre professionnel des diététistes du Québec

Health-related non-government organizations

Canadian Cancer Society

Canadian Cardiovascular Society

Canadian Diabetes Association

Cancer Care Ontario

Heart and Stroke Foundation of Canada

National Institute of Nutrition

Osteoporosis Society of Canada

Other non-governmental organizations

British Columbia Centre of Excellence for Women's Health

Canadian Association for Health, Physical Education, Recreation and Dance

Canadian Association on Gerontology

Canadian Fitness and Lifestyle Research Institute

Canadian Gerontological Nurses Association

Canadian Institute of Child Health (CICH)

Canadian Mental Health Association

Canadian Paediatric Society

Canadian Public Health Association

Canadian Society for Exercise Physiology

Inuit Tapiriit Kanatami

Maritime Centre of Excellence for Women's Health

National Aboriginal Health Organization (NAHO)

Prairie Centre of Excellence for Women's Health

The Assembly of First Nations (AFN)

The Canadian Women's Health Network

Other (Consumer/advocacy groups, food industry, federal government)

Consumers Association of Canada

Centre for Science in the Public Interest (CSPI)

Department of Defence

L'Union des Consommateurs

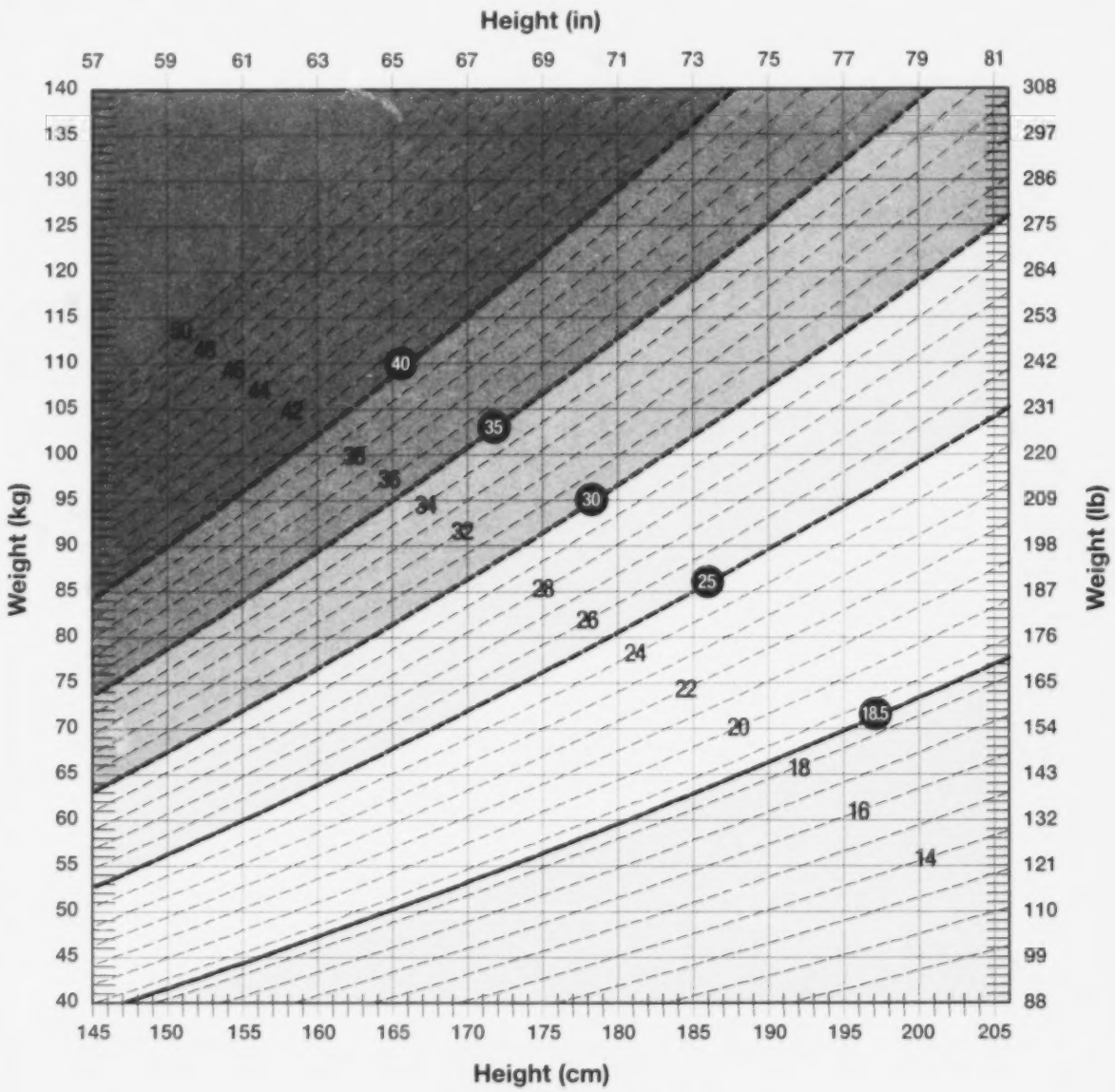
Food Information Council

The Food and Consumer Products Manufacturers of Canada

Appendix 7.6

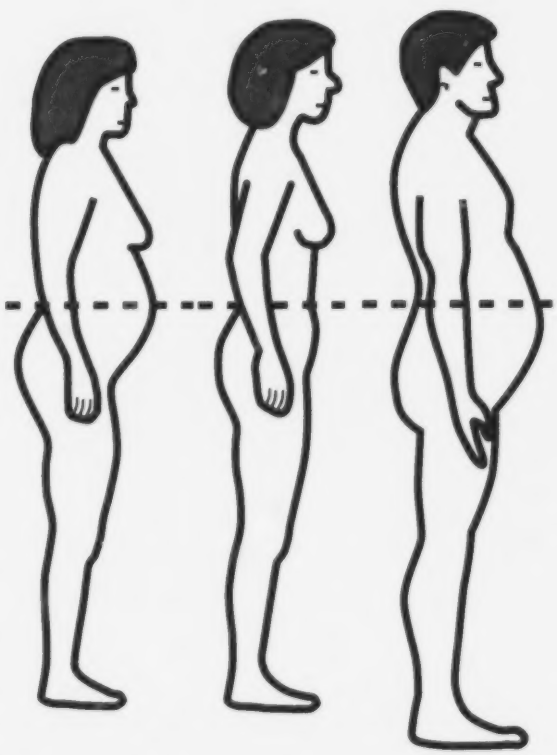
Body mass index nomogram

For a quick determination of BMI (kg/m^2), use a straight-edge to help locate the point on the chart where height (in or cm) and weight (lbs or kg) intersect. Read the number on the dashed line closest to this point. For example, an individual who weighs 69 kg and is 173 cm tall has a BMI of approximately 23.



Appendix 7.7
Waist circumference measurement

The WC is measured at the part of the trunk located midway between the lower costal margin (bottom of lower rib) and the iliac crest (top of pelvic bone) while the person is standing, with feet about 25-30 cm apart (10-12 in). The measurer should stand beside the individual and fit the tape snugly, without compressing any underlying soft tissues. The circumference should be measured to the nearest 0.5 cm (1/4 in), at the end of a normal expiration.



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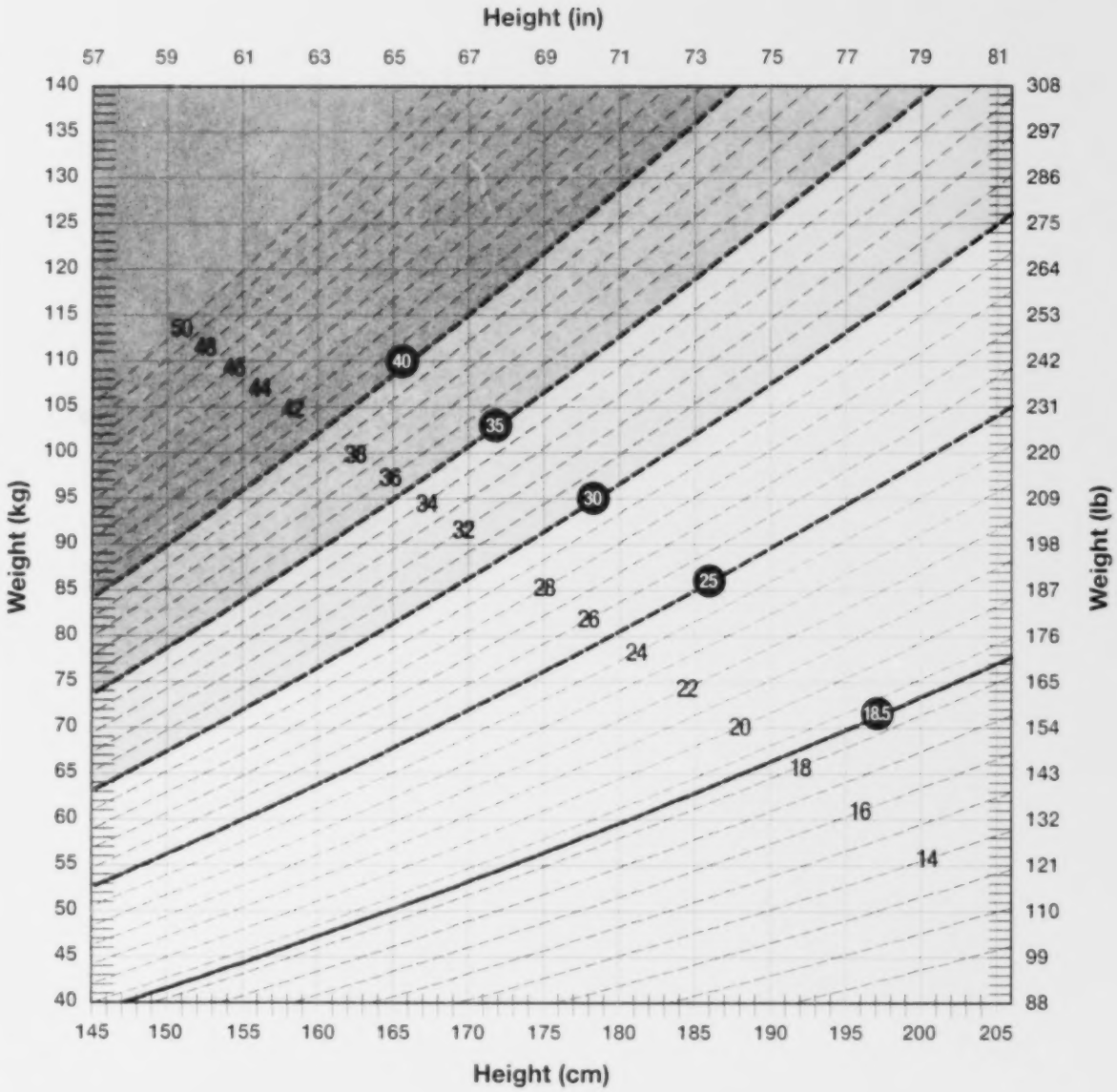

Appendix 7.7
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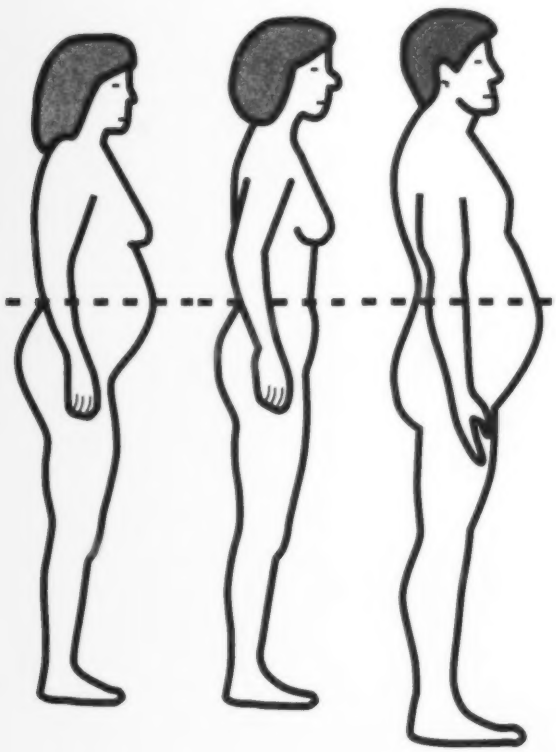

Appendix 7.8
1988 Canadian Guidelines for Healthy Weights

The 1988 *Canadian Guidelines for Healthy Weights* were based on the seminal work of Canadian researchers during the 1980's to develop a scientifically-based system that would show an association between body weight and health based on measures that were reliable and practical to use.

BMI was chosen as the best measure on which to base weight and health according to several criteria including epidemiological validity, precision, reliability, accuracy, availability, cost, client acceptability and level of skill needed to conduct the measurement. To select appropriate cut-off points for BMIs, Canadian data were reviewed as well as prospective and retrospective studies from the international literature. Based on an analysis of the BMI in relationship to various levels of morbidity and mortality, the cut-off points for BMI categories were established.

The limitations in using BMI on its own to predict health risk were recognized, specifically its inability to estimate abdominal fat. It was suggested that health professionals use the waist-hip ratio (WHR) measure as an estimate of abdominal obesity and an indicator of mortality and morbidity risk. The cut-off points provided for WHR were tentative because limited data were available for analysis at that time. No data were available on WC.

Table 7: Canadian Guidelines for Healthy Weights (1988)

Canadian Guidelines for Healthy Weights (for adults 20 to 65 years of age)

Zone A BMI Less than 20	Zone B BMI Between 20 and 25	Zone C BMI Between 25 and 27	Zone D BMI More than 27
May be associated with health problems for some people	Good weight for most people	May lead to health problems in some people	Increasing risk of developing health problems
	Generally acceptable range		

Measurement of Waist-to-Hip Ratio (WHR) is recommended as an indicator of body fat distribution. WHR values above 1.0 in men, and above 0.8 in women are indicative of increased risk of weight-related health problems. These values are tentative, as more research is needed in this area.

Source: Health and Welfare Canada. (1988). *Canadian Guidelines for Healthy Weights*. Report of an Expert Group Convened by Health Promotion Directorate, Health Services and Promotion Branch. Ottawa: Health And Welfare Canada, page 27

Appendix 7.9
WHO weight classification system

The WHO weight classification system is based primarily on the association between BMI and mortality risk. Similar to the 1988 *Canadian Guidelines for Healthy Weights,* the WHO system associates different BMI categories with different levels of health risk. In order to establish BMI categories, large data sets from both European and USA studies were analyzed to determine the BMI ranges related to various levels of mortality and morbidity. Based on these analyses, the cut-off points for BMI were established.

The WHO also emphasizes the need to include WC to identify individuals and groups at increased risk of obesity-related illness due to excess abdominal fat. The waist circumference (WC) was selected based on evidence that the WC is a more practical correlate of abdominal fat and is more closely related to health risk than the WHR. The WHO cut-off points were provided as an example only with the recommendation that population-specific cut-off values should be developed.

Table 8: WHO weight classification system (2000)

Classification of Overweight and Obesity in Adults According to BMI*

Classification	BMI	Risk of comorbidities
Underweight	<18.50	Low (but risk of other clinical problems increased)
Normal range	18.50-24.99	Average
Overweight	≥25.00	
Preobese	25.00-29.99	Increased
Obese class I	30.00-34.99	Moderate
Obese class II	35.00-39.99	Severe
Obese class III	≥40.00	Very severe

* These BMI values are age-independent and the same for both sexes. However, BMI may not correspond to the same degree of fatness in different populations due, in part, to differences in body proportions. The table shows a simplistic relationship between BMI and the risk of comorbidity, which can be affected by a range of factors, including the nature of the diet, ethnic group and activity level. The risks associated with increasing BMI are continuous and graded and begin at a BMI below 25. The interpretation of BMI gradings in relation to risk may differ for different populations. Both BMI and a measure of fat distribution (waist circumference or waist:hip ratio (WHR)) are important in calculating the risk of obesity comorbidities.

Source: World Health Organization. (2000). *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*. Geneva: WHO, page 9

Sex-specific waist circumference and risk of metabolic complications associated with obesity in Caucasians*

Risk of metabolic complications	Waist circumference (cm)	
	Men	Women
Increased	≥94	≥80
Substantially increased	≥102	≥88

* This table is an example only. The identification of risk using waist circumference is population-specific and will depend on levels of obesity and other risk factors for CVD and NIDDM. This issue is currently under investigation.

Source: World Health Organization. (2000). *Obesity: Preventing and Managing the Global Epidemic: Report of a WHO Consultation on Obesity*, Geneva: WHO, page 11